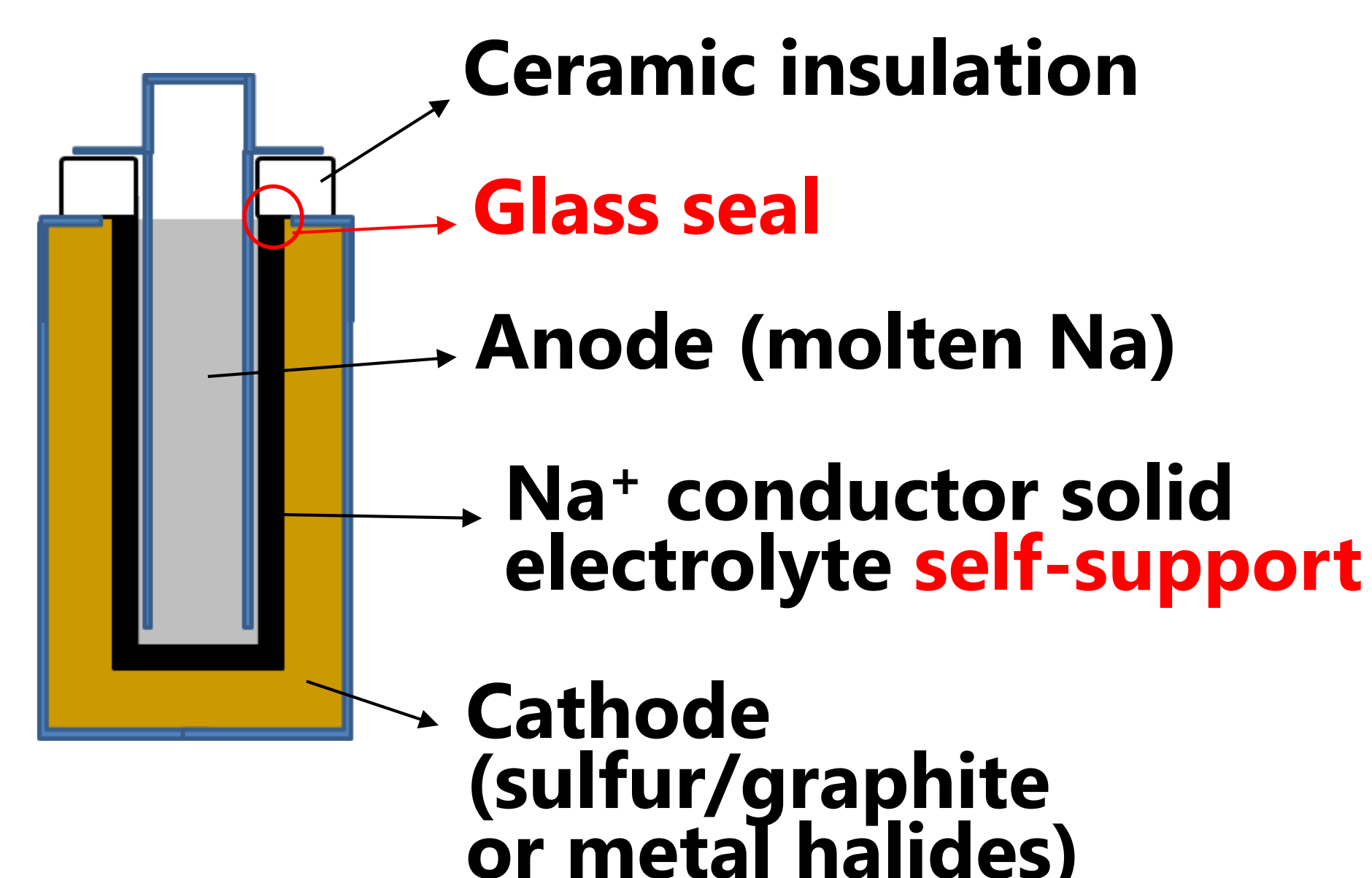


Advanced Sodium Battery with Enhanced Safety and Low Cost Processing

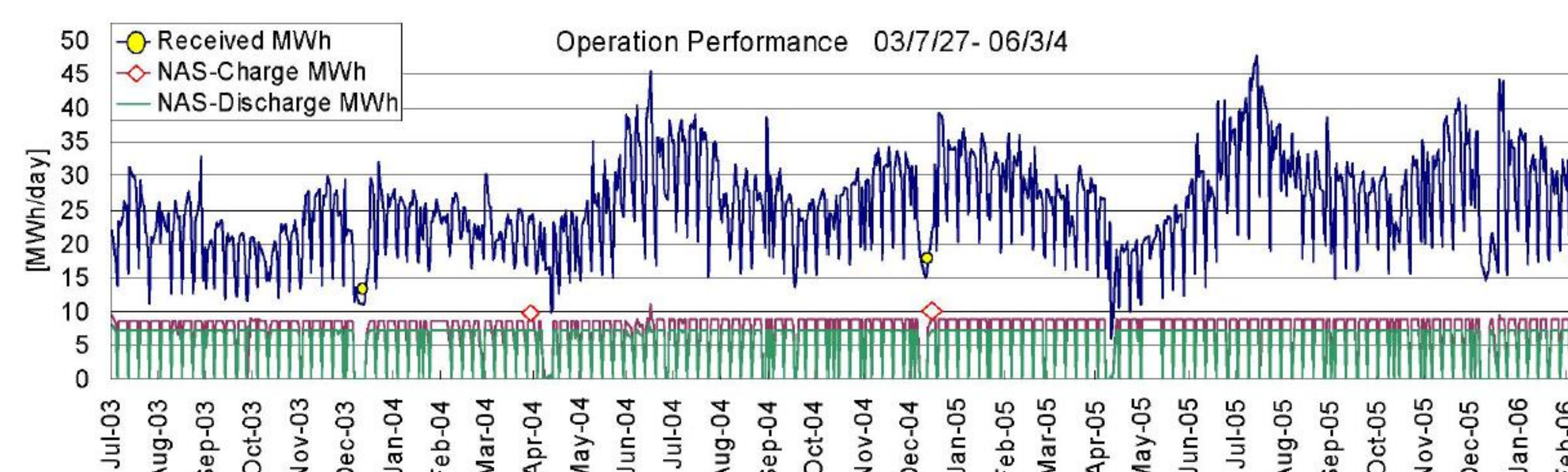
Joonho Koh (jkoh@msrihome.com), Materials & Systems Research, Inc., 5395 W 700 S, Salt Lake City, UT

Conventional Solid-Electrolyte Na Battery

- ✓ Electrolyte: Beta-alumina, Nasicon
- ✓ Electrolyte-support cells
- ✓ Operating at 300~350°C
- ✓ Proven battery chemistry
- ✓ Demonstrated cycle life (>5000)
- ✓ Commercialized successfully

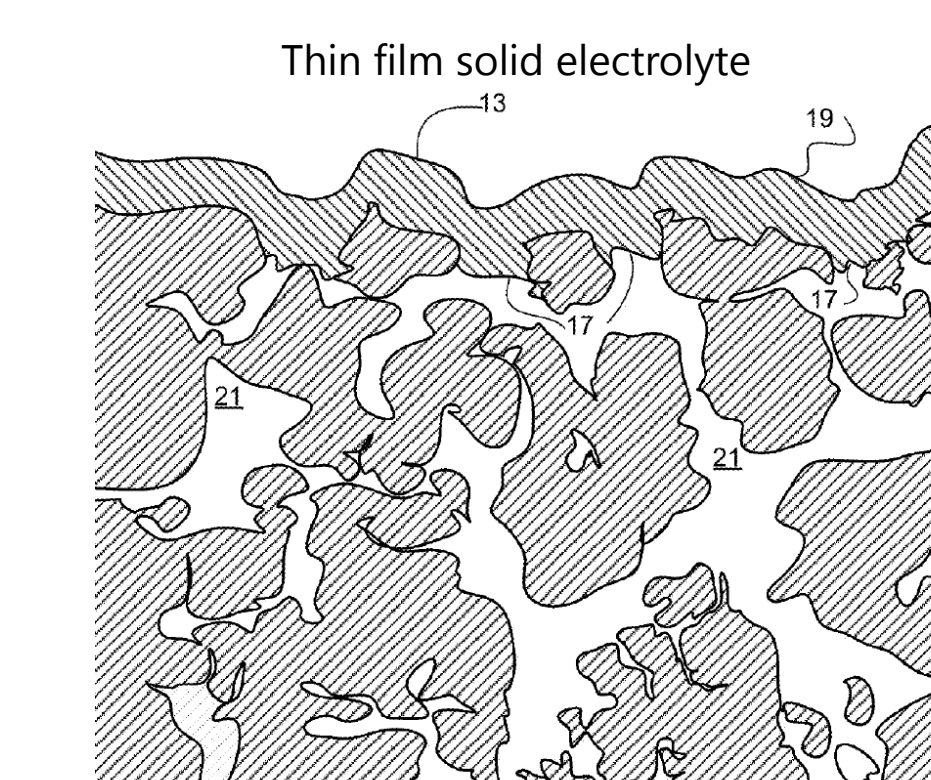
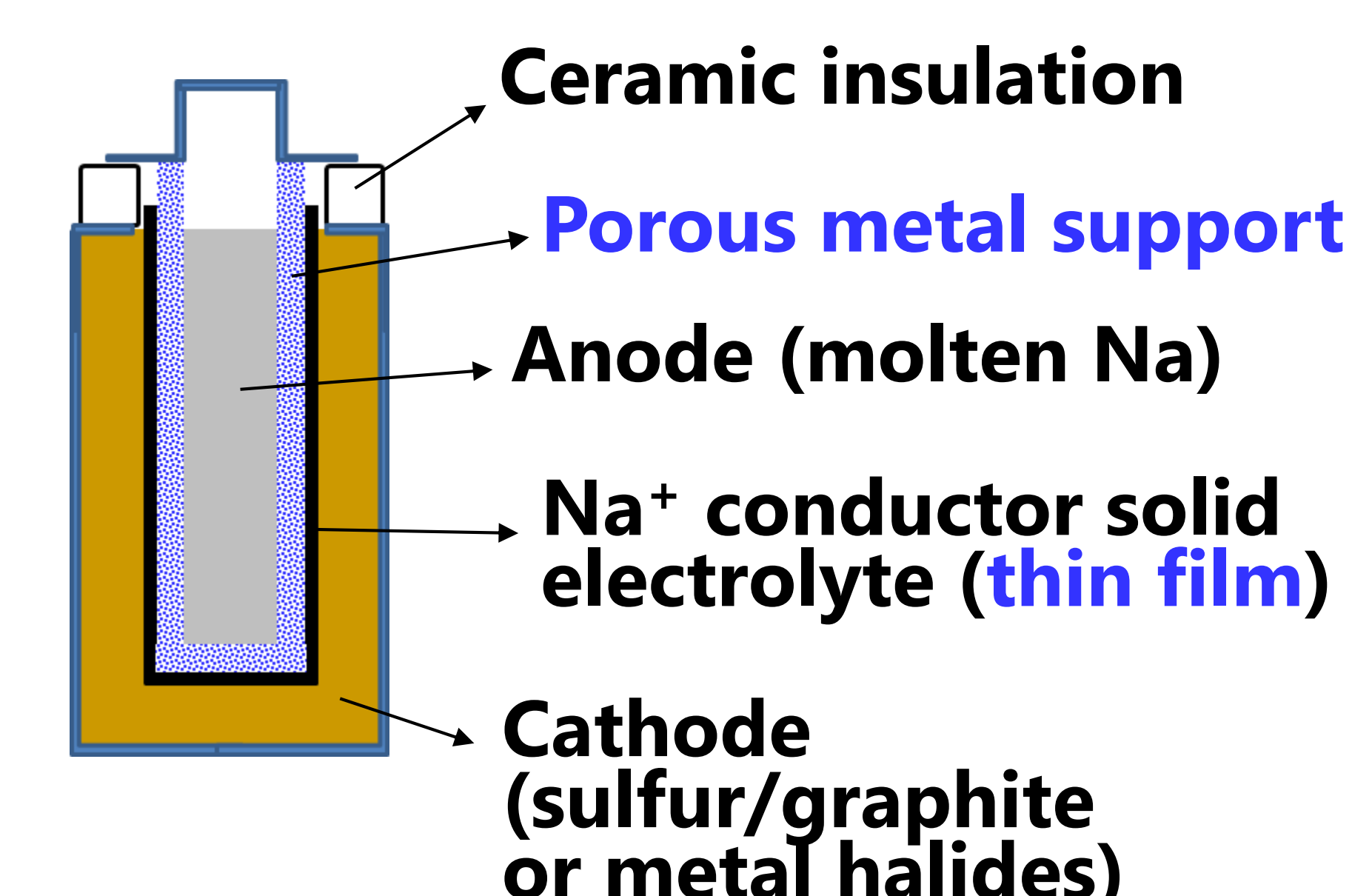


Example:
NGK's 1MW NaS battery system for load-leveling operation at Meisei Univ. (Japan) in 2003-2006



Advanced Solid-Electrolyte Na Battery

- ❑ Same active materials
- ❑ Same battery chemistry
- ❑ Electrode-support cells
- ❑ High-strength porous metal support (COTS)
- ❑ Thin film solid electrolyte
- ❑ Operating at <300°C
- ❑ Quick and low cost thermal spraying process
- ❑ Improved safety and lower fabrication cost



US Pat. Appl.
13/898,441
14/461,358

Project Description and Status

Project Objectives

- ❑ Advance the proven Na battery (solid-electrolyte) chemistry to more reliable and cost-effective battery technology
- ❑ Design for improved safety
- ❑ Apply low-cost cell fabrication processes

Progress to Date

- ❖ Designed a porous-metal-supported thin film battery cell structure
- ❖ Applied thermal spray process to deposit 100-300 μm beta-alumina solid electrolyte
- ❖ Demonstrated much higher mechanical strength and lower area-specific resistance (ASR) than the conventional cell structure

Future Plans

- Working on spray process optimization and post-spray densification
- Plan to fabricate and test tubular cells of 30-100 Wh
- Plan to demonstrate kW battery module and system prototype

Advanced Na Battery Cell Fabrication

